Like radiographic visualization, however, information obtainable by bacteriologic examination is not an infallible guide. The "negative" case is not necessarily a healed case. The experienced physician knows that healing may require months or years even after the disappearance of the bacilli from the excretions. A closed lesion may reactivate.

On the other hand, "positive" results of bacteriologic examination do not necessarily indicate a bad prognosis. Many persons with stable lesions and a few bacilli in the sputum are capable of carrying on for years, leading relatively normal lives or following a slightly restricted regimen. A fair proportion of these patients will become "negative" in the course of time and achieve relative or complete recovery. Of such patients discharged from the Barlow Sanatorium, about 40 per cent eventually become "negative."[4] All patients are discharged to the care of a chest physician to continue treatment.

Yet under reasonable auspices patients whose sputum has been rendered abacillary have a better prospect of recovery than those remaining bacteriologically "positive." The treatment of pulmonary tuberculosis cannot be considered entirely successful so long as there are tubercle bacilli in the sputum. Bacillary output always ceases before healing is complete. Abeles[1] found that the patient in whom the disease was arrested or apparently arrested and who was discharged with occasionally "positive" cultures, was three times as liable to reactivation of the disease as the patient with completely "negative" sputum. Chang[2] reported the ratio of reactivation to be two to one. In a previous study[4] the author observed that the likelihood of a patient remaining bacillus-free in follow-up tests after discharge was directly proportional to the number of months excretions were "negative" before discharge.

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Monaldi Procedure

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MONALDI catheterization of cavities in the lungs has been in use at Arroyo del Valle Sanatorium since 1940. In a ten-year period it was employed in about 50 cases. At first it was applied in practically every case in which the following three factors were combined: (1) Cavity 4 cm. or more in diameter, (2) no pleural space, (3) symptoms and signs of cavity block. If positive pressure readings were obtained, a catheter was inserted into the cavity. Early in the use of the procedure, decision to apply it was guided largely by the presence of intractable cough and toxicity, but it was soon learned that a patient may have a cavity of the tension type yet not have the so-called "blocked cavity cough."

Contrary to Monaldi's experience, it was found that cavities that apparently closed did not stay closed. For that reason, thoracoplasty was carried out as soon after the Monaldi catheterization as the patient was in condition for the operation. As cutting the Monaldi tract in the course of thoracoplasty became almost routine, preliminary rib resection was done. At first this was done before the Monaldi procedure was started. In some cases, however, there was rib regeneration before the patient was in condition for thoracoplasty, and in others thoracoplasty never was carried out. Hence it became the practice to do anterior rib resection below the tube ten days before the first stage of thoracoplasty was scheduled. This schedule has been satisfactory in most cases, although the surgeon must bear in mind that the serratus cannot be freed from the ribs as in a routine operation.

Results in some cases in the series were unsatisfactory, owing to several factors:

1. Catheterization of non-tension cavities.
2. Multiple cavities in the same lung.
3. Transient blocking of cavities that became unblocked after the Monaldi procedure had been done.
4. Lack of instruction of patients and personnel in operation of the apparatus and care of the Monaldi tube.

The complications encountered were:

1. Hemorrhage. In one case it occurred at the time of the procedure when a surgeon who was not experienced in the technique missed the cavity in several attempts. In several cases, bleeding through and around the tube necessitated discontinuance.

2. Pneumothorax. In the case in which this occurred, fluid accumulated. However, adhesive pleuritis sealed off the pleural space and the Monaldi procedure did not have to be discontinued.

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3. Tuberculous meningitis. This occurred in two cases. In one case the complication developed late, just before thoracoplasty was to be started. In the other case the patient had bilateral disease, was in poor condition, and use of the Monaldi procedure was ill-advised.

4. Subpectoral abscess developed in one case on the same side as that on which the catheter was introduced. It occurred three years after thoracoplasty and closure of the Monaldi tract. The thoracoplasty had been inadequate — one-stage, without cavity closure.

5. Monaldi tract cut at time of thoracoplasty. In all cases in which this occurred the patients recovered.

Although early experience was not good, better guides for the selection of candidates for the procedure have led to satisfactory results in cases of specific type. Monaldi catheterization is now restricted to cases in which any of the following conditions exist:

1. Positive pressure cavity with toxicity that does not respond to treatment with para-aminosalicylic acid.

2. Blocked cavity in a case in which the condition of the bronchus contraindicates resection.

3. Blocked cavity in a case in which the bacilli are streptomycin-fast.

4. Bilateral disease with blocked cavity at the apex of one lung.

If the Monaldi procedure is to be used, streptomycin should not be given first because usually after the drug is administered the cavity decreases in size to the point that insertion of the catheter becomes difficult or impossible.

For treatment of blocked cavity, regardless of location, resection is the procedure of choice if the condition of the patient will permit. The Monaldi procedure is at its best only in cases in which the cavity is in an upper lobe so that thoracoplasty can be done over the diseased area. In cases of bilateral disease, draining a blocked cavity in one lung often will result in improvement in the other. In some instances this result will have the effect of so far redeeming "hopeless" cases that definitive therapy ultimately will arrest the disease.

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Extrapleural Pneumothorax

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SUMMARY

Extrapleural pneumothorax is a valuable method of treatment of pulmonary tuberculosis. However, it is applicable in a relatively few cases which meet stringent criteria. Moreover, it entails the absolute necessity for continuity of care following operation. Within these limitations, the procedure will control tuberculosis in a small but significant number of patients.

EXTRAPLEURAL pneumothorax is an operation with distinct advantages and disadvantages. Advantages are that it is a one-stage procedure entailing minimal operative hazard with little shock, it does not often cause spread of infection, and no deformity results from the operation. The reduction in pulmonary function is small, which makes the operation of distinct value if lesions are bilateral. In theory, the operation should have a wide application in the surgical treatment of pulmonary tuberculosis, but in practice this is not so because of the disadvantages which amount practically to contraindications.

First, use of the procedure is limited to cases meeting sharply defined criteria. The disease should not have been present more than 12 to 18 months, with the lesion stabilized and productive. Pneumothorax must have been attempted without success, to make certain that the pleural space is obliterated. No cavity should be more than 3 cm. in diameter and all cavities should be surrounded by lung tissue. In extent, the disease should be localized and limited to the upper third of the lung field, which may include the superior segment of the lower lobe.

Extrapleural pneumothorax is not suitable in cases in which old fibrotic lesions with retraction are present. Giant cavities, tension cavities or cavities at the periphery of the lobe whose outer wall is at the pleura are contraindicative factors. The site of the lesion is important. Disease in the right middle lobe, the lingula or the basal segments of the lower lobe cannot be controlled by extrapleural pneumothorax. Ulcerative bronchitis is a definite contraindication.

A second and perhaps most important disadvantage is the necessity for meticulous and prolonged

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